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EVALUATION OF RESULTS OF EXPERIMENTS ON ARTIFICIAL INDUCEMENT OF PRECIPITATION

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EVALUATION OF RESULTS OF EXPERIMENTS ON ARTIFICIAL INDUCEMENT OF PRECIPITATION

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ARTIFICIALLY INDUCED PRECIPITATION

GENERAL: Attempts to modify the weather of any particular region date back to earliest recorded history. The earliest attempts were usually associated with religious rites, witch doctors or medicine men. There is some evidence that the Hopi Indian medicine men used a primitive form of cloud seeding with silver iodide from ground generators.

PRECIPITATION: The actual mechanism of natural formation of precipitation is still not thoroughly understood although it would appear that two basic methods are involved.

"Clouds are composed of tiny droplets of water and in some conditions, small ice crystals. The droplets, which are only about one thousandth of an inch in diameter, are so small that the space between them is large compared to their size. Raindrops are very much larger and relatively few in number. A single raindrop is made from over a million droplets.

Since the tiny droplets must be combined to form large drops before rain will fall, the process by which the change takes place is important. There are now believed to be two main processes acting in nature. One of these is by collision or joining together of the small droplets, called

the coalescence process. This process requires that some droplets be larger than others. Having a different motion, they collide with and sweep up smaller droplets thereby growing in time, to raindrop size. The other process requires the presence of ice crystals which are small flat, six-sided crystals of ice, somewhat larger than the droplets. These crystals collide with and sweep up the droplets, and grow gradually to a sort of granular snow, or under special conditions when there are a large number, into snowflakes. In falling, both the snow pellets and snowflakes may melt, to form rain." [1]

Because each droplet or ice crystal is formed around a nucleus attempts to artificially induce precipitation have been based on the introduction of suitable nuclei into water bearing cloud formations.

Silver iodide, dry ice, salt particles and water sprays have been used as artificial nuclei. Silver iodide has a crystal structure much like ice; dry ice produces a cooling effect and therefore condensation; salt particles are hygroscopic and attract water; water sprays coalesce other water particles.

1. "Weather Modification in North America" - The Research Dept., The Searle Grain Company, 1959.

Introduction of artificial nuclei has been accomplished by ground generator stations emitting silver iodide as a smoke, aircraft disbursing silver iodide smoke, dry ice pellets, salt particles and water sprays and by balloons carrying salt particles aloft into clouds. The latter method has apparently been used most extensively in Africa. Commercial "rainmakers" generally favour the use of ground generators producing silver iodide smoke. This method would appear to provide no certainty of introducing the artificial nuclei into the clouds as the path of the smoke is dependent on wind velocity and direction and thermal currents. The use of aircraft is the most positive method and also the most expensive.

Precipitation can not be induced from clear skies or from clouds which do not contain moisture. Cumulus clouds offer the greatest possibility of precipitation but stratus clouds offer some possibility. Moisture bearing clouds are more liable to form on the windward side of mountains.

TEST RESULTS: Generally all cloud seeding experiments have been conducted without adequate controls so that the effect of the seeding is open to question. Evaluation is extremely difficult in that the amount of rainfall which would have occurred

without seeding is not known. Results of commercial endeavors in the United States and Canada have led to varying claims of effectiveness. In general, objective observers have stated that at best the results are inconclusive, with some indication that cloud seeding may decrease the amount of precipitation.

Between 1958 and 1963 the Canadian Department of Transport, Meteorological Branch seeded forty-five storms in north western Quebec, under rigidly controlled conditions and using an adjacent unseeded control area. This is probably the most rigid test made of artificial inducement of precipitation. (The method of seeding was by airborne sodium iodide smoke generator) The statistical analysis of the test data indicates a negative value of 2.5% for seeding. For the 95% probability the range is from -22% to +22%. Again the results are at best inconclusive.[2]

SUMMARY: Attempts at scientifically producing artificially induced precipitation have been carried out over the past twenty years.

The results of all tests, including a rigidly controlled experiment performed by the Canadian Department of

2. "Precipitation Physics Project Report on Cloud Seeding Evaluation 1960-1963, Dept. of Transport, Met. Branch, May 1965

Transport, have at best been inconclusive. There is some statistical evidence that cloud seeding may actually reduce the amount of precipitation.

There is no evidence that cloud seeding will produce any significant increase in the amount of precipitation, and all cloud seeding operations should be considered as experiments.

ARTIFICIALLY INDUCED PRECIPITATION

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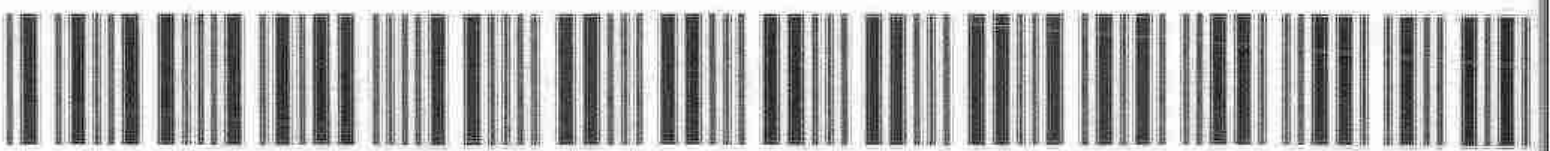
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